Relationship between pollen load and flight in agaonid wasps

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ABSTRACT.— Observations suggest that in *Allotriozoon heterandromorphum* Grandi, the pollinator of *Ficus vogelii* (Miq.) Miq. in Ghana, a pollen load in the mesothoracic pockets is needed for flight.

It is now known that the females of several chalcid wasps in the family Agaonidae, which are responsible for the pollination of *Ficus* species (Moraceae), possess special containers in the exoskeleton for carrying pollen from one inflorescence to another (Galil & Eisikowitch, 1969; Ramirez, 1969). Studies on the behaviour of the wasps have shown that the collection of pollen and filling of the containers is a deliberate action on the part of the wasps. One point of special interest which was noted at the time this discovery was reported is that the behaviour associated with pollen loading appeared to be of no direct benefit to the insect, except on a long-term basis (Galil & Eisikowitch, 1969). During studies on the pollination ecology of *Ficus vogelii* (Miq.) Miq. in Ghana a possible relationship between pollen carrying and another aspect of insect behaviour was observed.

F. vogelii is pollinated by *Allotriozoon heterandromorphum* Grandi (identified by Dr. J. T. Wiebes, Rijksmuseum van Natuurlijke Historie, Leiden, to whom grateful acknowledgement is made), which carries pollen in a pair of mesothoracic pockets. It was observed that when the mature female wasps emerged from the ripe syconia in laboratory conditions, some flew away immediately whilst others simply crawled away. All wasps emerging from a number of freshly gathered syconia were examined to determine whether there is any relationship between pollen loading and flight behaviour. Freshly gathered syconia were placed singly into beakers. In one set of observations whole, intact syconia were used; in another set the syconia were split open before being placed into the beakers. The beakers were left uncovered so that the emerging insects had the opportunity to fly out. Wasps which escaped by flying out of the beakers did not travel far, and were later captured from the surrounding bench area. These, and the wasps found crawling within the beakers, were immersed in 45% acetic-carmine and examined for the presence or absence of pollen in the mesothoracic pockets. Results are shown in tables 1 and 2.

Table 1. Pollen load of wasps from intact syconia.

Syconium	No. of wasps flying	No. with pollen	No. of wasps crawling	No. with pollen
1	20	17	4	0
2	18	18	9	0
3	12	11	8	1
4	17	13	6	0
5	13	13	5	0
6	15	12	5	0
7	19	18	6	0
8	20	18	8	0
9	23	20	5	1
10	17	17	7	1

Table 2. Pollen load of wasps from split syconia.

Syconium	No. of wasps flying	No. with pollen	No. of wasps crawling	No. with pollen
1	6	6	18	0
2	10	9	20	2
3	8	8	13	1
4	12	12	20	3
5	5	5	20	4
6	14	13	20	4
7	9	7	16	2
8	7	7	17	2
9	6	6	20	3
10	5	5	12	0

These results indicate a positive relationship between pollen carrying and flying. It will be seen that when the syconia were split open, most of the wasps left the syconia without gathering pollen. Galil and Eisikowitch (1974) have now confirmed that when the syconia are disturbed and the micro-environmental conditions within the syconia altered, female wasps may fail to gather pollen. Our observations suggest that the wasps may need a pollen load for flight. The possible role of the pollen load in maintaining balance and stability during flight requires further investigation. The direct effect of a pollen load on insect flight could have been an important selection factor in the evolution of the pollen loading mechanism and associated insect behaviour.

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PFLETSCHINGER, H., BONTE WERELD DER INSEKTEN. Nederlandse bewerking J. M. Duiven. Tweede oplage. 72 pp, 120 kleurenfoto's, 30 fign. N. V. W. J. Thieme & Cie, Zutphen. Prijs (geplastificeerd) *f* 8,25. ISBN 90-03-94320-6.

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